

What is claimed is:

1. An apparatus for fabricating a mold including:

a die set which is open at an upper side and a lower side, the die set having a reception portion to receive die steel to be fabricated to a mold;

a mold flask having a cavity of a mold shape, the mold flask being attached such that the mold flask seals an open upper side of the reception portion of the die set and the mold flask is detachable;

a means for heating the die steel such that the die steel received in the reception portion of the die set is converted into a semisolid state where a liquid phase and a solid phase are mixed;

a pressurization plunger being installed so as to move through an opening at the lower side of the reception portion of the die set, thus to pressurize the semisolid die steel in an upper direction such that the semisolid heated die steel by the heating means is filled to the mold flask;

a pressure control means for improving a filling efficiency of the die steel by making a circumference of the mold flask into a vacuum state when the pressurization plunger pressurizes the die steel; and

a graphite heat insulating board installed movably in left and right directions between the die steel received in the reception portion and the mold flask, the graphite heat insulating board insulating an upper portion of the die steel being heated with it displaced at the upper portion of the die steel received at the time of heating, and installed such that it moves detachably from a

progressive direction of the semisolid die steel at the time of filling.

2. The apparatus for fabricating a mold of claim 1, wherein
5 the means for heating die steel includes an induction heating coil for heating die steel charged in the reception portion, the induction heating coil installed at a circumference of the reception portion of the die set, and a control portion for controlling an operation
10 of the induction heating coil and a heating temperature, the induction heating coil installed so as to be replaced by a high frequency or a medium frequency coil depending on a size of die steel received in the reception portion of the die set.

15 3. The apparatus for fabricating a mold of claim 1, wherein the mold flask includes within a structure of the mold flask a cooling pipe arrangement formed along a contour of a shape of a mold to be formed such that a shape of
20 the cooling pipe arrangement is similar to that of the contour, the cooling pipe arrangement being selected from the group consisting of a cooling pipeline, a salt pipeline and a Zn alloyed Zamak pipeline.

25 4. The apparatus for fabricating a mold of claim 1, wherein the die steel has a shape of a circular rod.

5. The apparatus for fabricating a mold of claim 4, the
30 die steel has lots of slits formed on a circular face of the circular rod along a longitudinal direction.

6. The apparatus for fabricating a mold of claim 5, the lots of slits are in symmetry with each other with respect to an axis of the circular rod.

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7. A method for fabricating a mold using the apparatus of claim 1 including steps of:

- 10 (a) charging a solid die steel into the reception portion of the die set and placing the graphite heat insulating board above the die steel charged in the reception portion;
- (b) attaching the mold flask so that the mold flask seals the upper region of the reception portion;
- 15 (c) heating the solid die steel charged in the reception portion so that it is transferred to a semisolid state where a liquid phase and a solid phase are mixed;
- (d) removing the heat insulating board away from the progressive direction of the semisolid die steel and then filling the semisolid die steel into the mold flask by pressurizing the semisolid die steel; and
- 20 (e) cooling the die steel filled in the mold flask.

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8. The method for fabricating a mold of claim 7, wherein the cooling step includes cooling the mold flask after the separation of the mold flask from the die set, and further including a new mold fabricating process using new die steel and new mold flask.

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9. The method for fabricating a mold of claim 7, wherein the die steel has a shape of a cylindrical bar.

10. The method for fabricating a mold of claim 9, the heating in the step (3) is performed by an induction heating.

11. The method for fabricating a mold of claim 10, wherein the die steel has a diameter less than 150 PHI, and the heating in the step (3) is performed by a high frequency induction heating.

12. The method for fabricating a mold of claim 10, wherein the die steel has a diameter more than 100 PHI, and the heating in the step (3) is performed by a middle frequency induction heating.

13. The method for fabricating a mold of claim 12, wherein the die steel has a lot of slits formed along a curved face of the cylindrical bar.

14. The method for fabricating a mold of claim 13, wherein the lot of slits are in symmetry with each other in respect to an axis line of the cylindrical bar.

15. The method for fabricating a mold of claim 7, wherein the heating in the step (3) is performed at a temperature of 1,200°C to 1,540°C during 1 minute to 120 minutes.

16. The method for fabricating a mold of claim 7, wherein in the step (4) a ratio of a liquid phase in the semisolid

die steel is 0.01 to 0.9, an applied pressure is 3 Mpa to 500 Mpa, and a pressurization rate is 0.1 m/s to 10 m/s.

5 17. The method for fabricating a mold of claim 7, wherein the heating step (3), the filling step (4), and the cooling step (5) are performed at an atmosphere selected from the group consisting of a vacuum atmosphere, a nitrogen atmosphere, and a hydrogen atmosphere.

10 18. The method for fabricating a mold of claim 7, wherein cooling in the step (5) is performed at a cooling rate less than 40 °C/s.

15 19. The method for fabricating a mold of claim 7, further including a step of performing an annealing treatment or a quenching and annealing treatment after the step (5).

20 20. The method for fabricating a mold of claim 7, wherein the mold flask is a ceramic mold flask formed through a step of fabricating a master pattern and then a step of fabricating a mold flask formed of ceramic slurry so as to correspond to the master pattern.

25 21. The method for fabricating a mold of claim 20, wherein, in order to make mass production of the mold possible, a step of fabricating a silicon mold is included between a step of fabricating the master pattern and a step of
30 fabricating a mold flask.

22. A method for fabricating a mold including steps of:

- (a) forming a lot of slits in die steel;
- (b) heating die steel having the lot of slits so as to be in a semisolid state where a liquid phase and a solid phase are mixed;
- (c) filling the semisolid die steel into a mold flask under pressure; and
- (d) cooling the filled die steel in the mold flask.